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Records of the Ornate Hawk-eagle, *Spizaetus ornatus* (Daudin, 1800) (Accipitridae), from the state of São Paulo, southeastern Brazil

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Abstract
We review the distribution of the Ornate Hawk-eagle, *Spizaetus ornatus* (Daudin, 1800), in the state of São Paulo, reporting localities with records of the species. Most locations where the species has been historically documented have no recent records, especially to the west of the large remnants of forest in the coastal mountain ranges. Most current records come from Serra de Paranapiacaba, southwestern São Paulo, whereas no records exist within the Cerrado domain. Unlike the neighboring state of Minas Gerais, where it is found in fragmented landscapes, in São Paulo, the species occurs exclusively within protected areas in large blocks of Atlantic Forest.

Key words
Atlantic Forest; threatened species; semideciduous forests; Cerrado phytogeographic domain.

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Introduction

The Ornate Hawk-eagle, *Spizaetus ornatus* (Daudin 1800), is a medium-sized (56–65 cm, wingspan 107–127 cm), distinctive eagle of the family Accipitridae. The species is widely distributed in tropical forests throughout Central and South America, occurring from sea level up to 1,800 m a.s.l. in southeastern Mexico south to Brazil, Paraguay and northern Argentina (Ferguson-Lees and Christie 2001). Usually seen lonely or in pairs, it inhabits primarily the interior of large forested areas, where it frequently soars above the canopy. It is often seen foraging at forest edges, foothills, along rivers and other openings (Ferguson-Lees and Christie 2001, Whitacre et al. 2012).

Although still regularly found in the Amazon, southern populations of the species have declined due to extensive deforestation and persecution (Thiollay 1994, Bildstein et al. 1998, Zilio 2017). The species is listed as regionally endangered in all southern and southeastern Brazilian states (Bergallo 2000, Straube et al. 2004, Simon et al. 2007, Silveira et al. 2009, COPAM 2011, São Paulo 2014), except in Santa Catarina and Rio Grande do Sul, where it is considered critically endangered (CONSEMA 2011, Rio Grande do Sul 2014). *Spizaetus ornatus* was recently rediscovered in the southernmost Brazilian state of Rio Grande do Sul, where it was considered regionally extinct (e.g. Mendonça-Lima et al. 2006), while questionable historical records from northeastern Brazil (Carlos and Girão 2006) are now corroborated by a recording from the Caatinga domain (Cerqueira et al. 2015).

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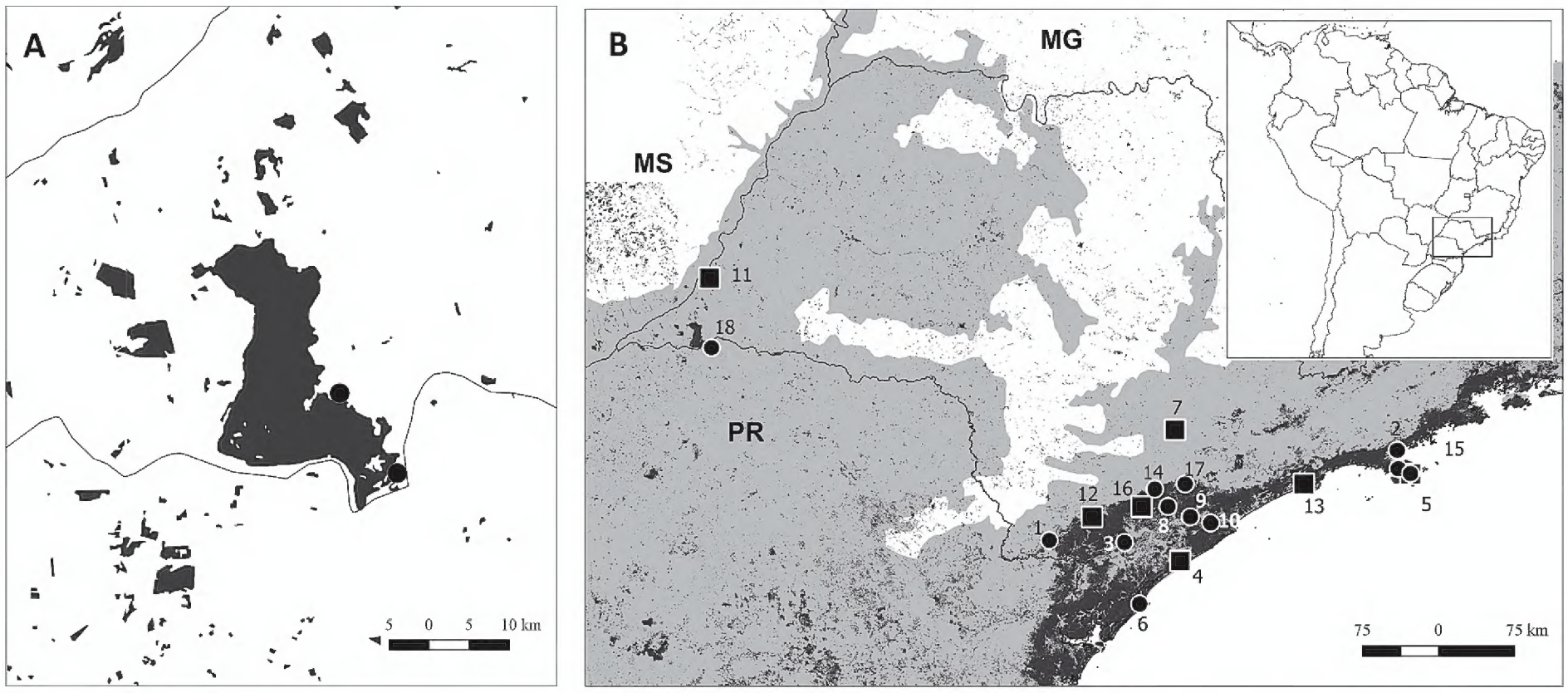

Figure 1. Locations with records of *Spizaetus ornatus* in the state of São Paulo, southeastern Brazil. **A.** Localities of recent records within Morro do Diabo State Park. **B.** All records of the species in São Paulo. Squares represent historical records (pre-1980s) and circles show recent records. Numbers are cross-referenced with Table 1. Light grey indicates the Atlantic Forest phytogeographic domain, while dark gray indicates remnants of the original vegetation; white represents the Cerrado domain.

Here we report the first 2 documented records of *Spizaetus ornatus* from the interior semideciduous forests from São Paulo and present an update of its distribution within this state.

Methods

We searched for records of *S. ornatus* in the literature and in the on-line databases E-Bird, the Internet Bird Collection, Macaulay Library, Wiki Aves and Xeno-canto up to 27 May 2018. In addition, we report the first documented records from the 34,000 ha Morro do Diabo State Park (Fig. 1), in Teodoro Sampaio municipality, westernmost São Paulo state.

Results

We compiled 22 records of *S. ornatus* from 18 locations within the state of São Paulo (Table 1). Of these, 11 are historical records spanning from the 19th century up to the 1980s, while the remaining half are from the 2000s up to the present. The sole interior record for semideciduous forests are museum specimens from Barra do Ribeirão dos Guachos, municipality of Presidente Epitácio (Willis and Oniki 2003), on the left bank of the Paraná river, western São Paulo. There are 5 specimens collected at the Ipanema National Forest in the 19th century (Pelzeln 1868). Records in the state show that for the last 39 years, the species seems restricted to protected areas within the 2 mountain ranges along the coast, the Serra do Mar and especially the Serra de Paranapiacaba (Granzinolli 2009).

In addition to the records presented by Granzinolli (2009), there are a few other records of *S. ornatus* within São Paulo in the on-line databases Internet Bird Collection and Wiki Aves (Table 1, Fig. 1). With one exception, all recent records are restricted to protected areas.

New records. Brazil: São Paulo, Teodoro Sampaio, Morro do Diabo State Park, headquarters (22°37′15.59″ S, 052°10′09.89″ W, 270 m), Vagner Cavarzere, 19 January 2015 (photographed adult individual opportunistically hand-captured by park rangers); Brazil: São Paulo, Teodoro Sampaio, Morro do Diabo State Park, Linhão Trail (22°32′26.73″ S, 052°14′48.34″ W, 270 m), Gustavo Muniz, 11 November 2017 (adult individual photographed, Fig. 2). Park rangers reported *S. ornatus* was following a mid-sized bird (the description of which was not accurate enough to be identified) at 18.30 h close to the forest edge. As the raptor failed on its attempt, it hit the ground and was unable to fly due to the tall *Urochloa* sp. grass on which it fell. A park ranger photographed the individual, which was then released. We examined the photograph and confirmed its identity and age. On the second occasion, during systematic bird surveys, Gustavo Muniz played back its vocalization, to which it promptly responded at 18.24 h.

Identification. We readily identified these individuals as *Spizaetus ornatus* due to the characteristic black crown and crest, with chestnut on the sides of the head and yellow legs (Ferguson-Lees and Christie 2001).

Discussion

Unlike records obtained in the state of Minas Gerais, where the species has been commonly recorded in semi-open areas and severely fragmented landscapes (Zorzin et al. 2006, Salvador-Jr 2011, Canuto et al. 2012), all available records from São Paulo suggest that *S. ornatus* is found in areas with large blocks of forest; there are no records from highly fragmented landscapes. Historical accounts are from formerly continuous forested areas. In addition, in São Paulo, the species does not occur within the Cerrado phytogeographic domain.

Table 1. Locations and respective years of records (ascending order) of the Ornate Hawk-eagle within the state of São Paulo, southeastern Brazil. Dashes indicate lack of information. In the Documentation column, numbers preceding letters refer to the number of photographs (P) or recordings (R). * only 2 e-vouchers are presented if more are available. Internet Bird Collection (IBC), Wiki Aves (WA).

Year of record	Dates	Locality	Latitude (S)	Longitude (W)	Municipality	Documentation	Source	E-voucher*	No. in Table 1
1819–1822	—	Ipanema National Forest	23°25′34″	047°38′21″	Iperó	5 museum specimens	Willis & Oniki (2003)	—	7
1979–1983	—	House along road	24°30′27″	048°27′16″	Sete Barras	—	Willis & Oniki (2003)	—	16
1984	—	Castelhanos beach	23°51′21″	045°21′03″	Ilha Bela	—	Willis & Oniki (2003)	—	5
1987–1988	—	Intervales State Park - headquarters	24°18′29″	048°16′35″	Ribeirão Grande	—	Willis & Oniki (2003)	—	12
2011–2018	1 documentation fall 2014, 2 documentations winter 2012 and 2013, 10 documentations spring 2011, 2012 and 2017, 250 documentations summer 2012 and 2016–2018	Alto do Ribeira State Park, Bairro da Serra, Santa Clara Farm	24°35′14″	048°36′00″	Iporanga	248P, 5R	Wiki Aves	WA2820025, WA2965012, IBC	8
2011–2012	3 documentations spring 2011, 5 documentations fall and winter 2012	Zizo Park	24°01′12″	047°48′39″	São Miguel Arcanjo	6P, 2R	Wiki Aves	WA721034, WA726035	14
2012	8/25/2012	Barra do Una - Parque Estadual da Serra do Mar	23°43′29″	045°44′18″	São Sebastião	1P	Wiki Aves	WA728033	15
2012–2017	2 documentations fall and winter 2012 and 2017, respectively	Serra do Morro do Cuscus	24°13′33″	047°30′22″	Tapiraí	2P	Wiki Aves	WA608406, WA2603705	17
2013–2017	1 documentation fall 2017, 4 documentations winter 2013 and 2016, 32 documentations spring 2014 and 2016, 24 documentations summer 2016 and 2017	Caverna do Diabo State Park, Itapeúna, Quilombo Ivaporunduva	24°38′21″	048°24′39″	Eldorado	60P, 1R	Wiki Aves	WA2849570 , WA2902072	3
2013	1/18/2013	Sítio do Oricongo Bonete	23°54′38″	045°20′17″	Ilha Bela	1P	Wiki Aves	WA859302	5
2013–2017	3 documentations fall 2013 and 2014, 3 documentations spring 2017, 3 documentations summer 2017	Intervales State Park	24°18′29″	048°16′35″	Ribeirão Grande	9P	Wiki Aves	WA941124, WA2812566	12
2015–2018	2 documentations summer 2017, 2 documentations fall 2018	Morro do Diabo State Park	22°32′26.73″	052°14′48.34″	Teodoro Sampaio	4P	This communication	WA2771085, WA2959154	18
2017	5/25/2017	Fazenda Serra Mar	23°36′36″	045°27′32″	Caraguatatuba	4P	Wiki Aves	WA2567835, WA2567856	2
2017	1 documentation winter 2017, 1 documentation summer 2018	Legado das Águas	24°03′22″	047°12′57″	Miracatu	1P, 1R	Wiki Aves	WA2773927, WA2905337	9
2018	5/16/2018	Alto do Ribeira State Park - Caboclos	24°26′43″	048°34′38″	Apiaí	1R	Wiki Aves	WA2982002	1
–	—	—	25°02′03″	047°12′50″	Iguape	—	Willis & Oniki (2003)	—	4
–	—	Ilha do Cardoso State Park	25°88′07″	047°56′16″	Ilha do Cardoso	—	Granzinolli (2009)	—	6
–	—	—	24°35′32″	048°35′13″	Iporanga	—	Willis & Oniki (2003)	—	8
–	—	Jureia-Itatins Ecological Station	24°23′00″	047°04′44″	Peruíbe	—	Granzinolli (2009)	—	10
–	—	Barra do Ribeirão dos Guachos	22°21′50″	052°13′55″	Presidente Epitácio	—	Willis & Oniki (2003)	—	11
–	—	Intervales State Park - Galo Perdido river	24°18′29″	048°16′35″	Ribeirão Grande	—	Willis & Oniki (2003)	—	12
–	—	—	24°04′56″	046°12′48″	Santos	Museum specimen	Willis & Oniki (2003)	—	13

Figure 2. Adult individual of *Spizaetus ornatus* photographed after play back at Morro do Diabo State Park, westernmost state of São Paulo, southeastern Brazil. (Photographed by Gustavo Muniz).

Uezu (2006) failed to record the species at Morro do Diabo State Park between 2002 and 2005. Because of an unpublished and undocumented previous sighting of the species, at that time he suggested it was highly threatened and probably extinct in the reserve. Likewise, no records come from the Mantiqueira mountain range. However, as there is suitable habitat for the species, we predict it is likely to be recorded within the Mantiqueira mountain range in São Paulo as well as in the states of Minas Gerais and Rio de Janeiro. Similar to what occurred in Morro do Diabo State Park, it may have been overlooked due to its low densities and large home ranges, estimated to be approximately 19 km^2 for adult males (Whitacre et al. 2012).

Pristine or mature secondary forests at the 5,000 ha Ipanema National Forest are long gone and the species has not been recorded there since the 19th century (Cavarzere et al. 2017). In Presidente Epitácio, where the species has also been previously recorded, there are still some relatively large (ca 500 ha) remnants. We suggest *S. ornatus* may be detected there if these forest remnants are exhaustively surveyed, but we reinforce the species requires large, unbroken forest areas, confirming its critical situation in the Atlantic Forest (Zilio 2017).

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Authors' Contributions

VC obtained photographs of one specimen caught by park rangers during another project and wrote the text; GM photographed one specimen; PAS and WFT wrote the text.

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